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Shibusawa et al.

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[54] **COPIES WITH AUTOMATIC DOCUMENT FEEDER**

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[73] Assignee: **Rocoh Company, Ltd.**, Tokyo, Japan

[21] Appl. No.: **372,176**

[22] Filed: **Jun. 27, 1989**

Related U.S. Application Data

[63] Continuation of Ser. No. 235,520, Aug. 24, 1988, abandoned.

[30] **Foreign Application Priority Data**

Aug. 28, 1987 [JP] Japan 62-216194

[51] **Int. Cl.**[5] **G03G 15/00**

[52] **U.S. Cl.** **355/309**; 355/75

[58] **Field of Search** 355/75, 76, 48, 50, 355/51, 308, 309, 313; 271/291, 301, 902

[56] **References Cited**

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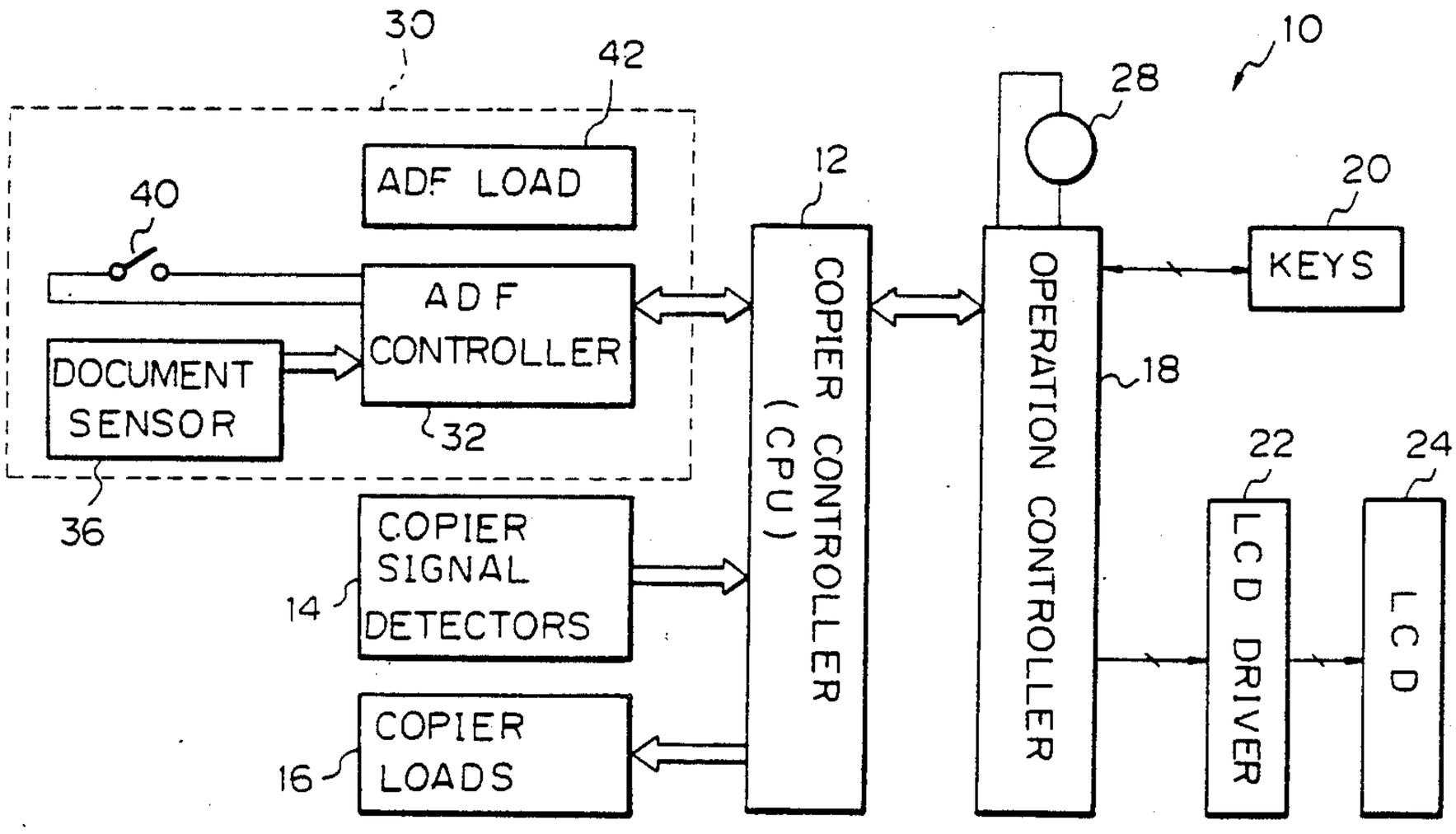
Attorney, Agent, or Firm—Oblon, Spivak, McClelland, Maier & Neustadt

[57] **ABSTRACT**

A copier selectively operable in a cover plate mode which uses a cover plate and an automatic document feeder (ADF) mode which uses an ADF. After a cover plate mode operation of the copier, a person is inhibited from operating the copier when a condition wherein the cover plate is closed and documents are loaded on a document feed table of the copier is detected.

6 Claims, 7 Drawing Sheets



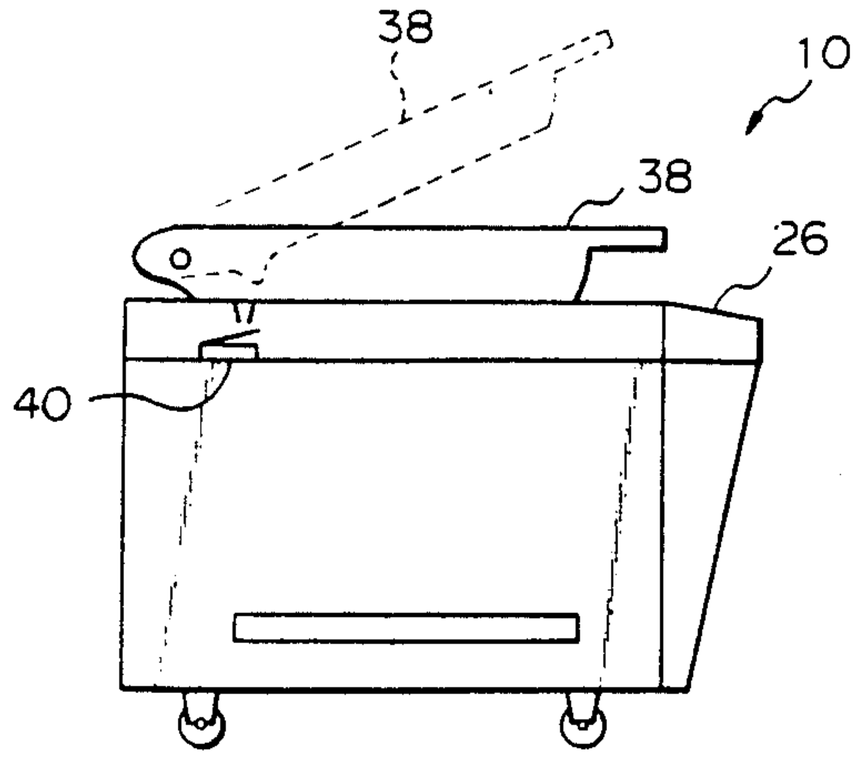


Fig. 1

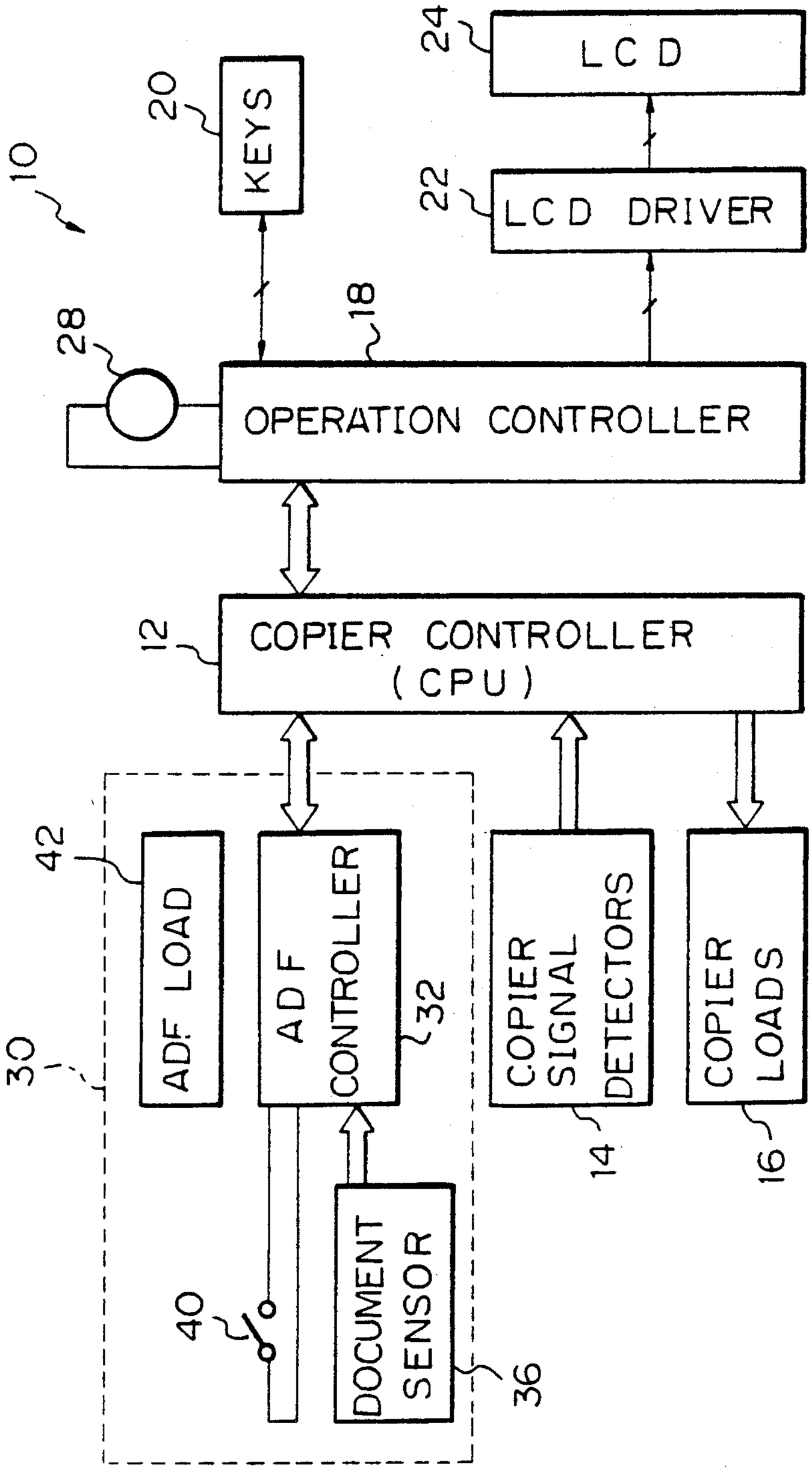

10
12 COPIER CONTROLLER (CPU)
14 COPIER SIGNAL DETECTORS
16 COPIER LOADS
18
20 KEYS
22 LCD DRIVER
24 LCD
28
30
32 ADF CONTROLLER
36 DOCUMENT SENSOR
40
42 ADF LOAD
OPERATION CONTROLLER

Fig. 2

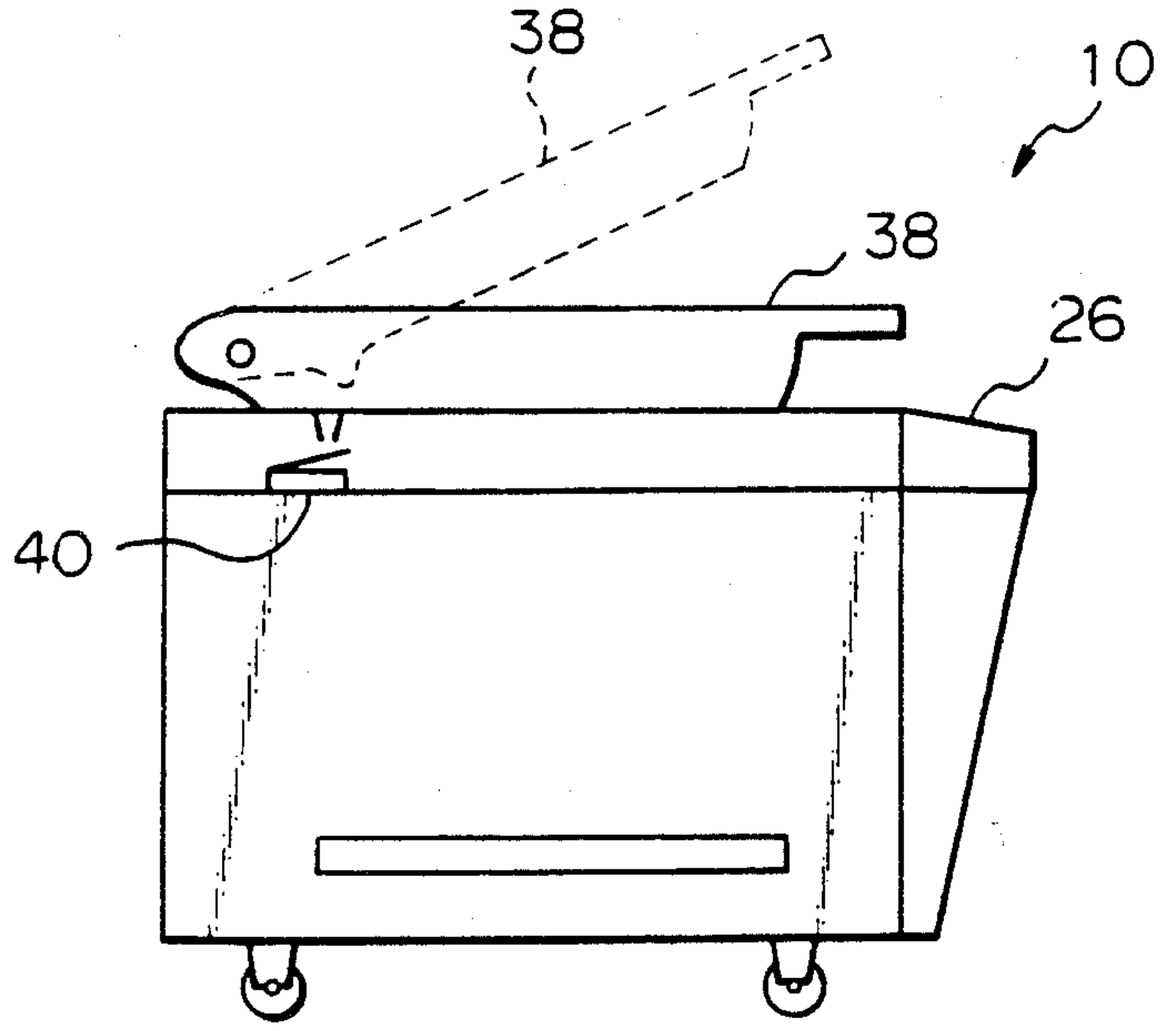


Fig. 3

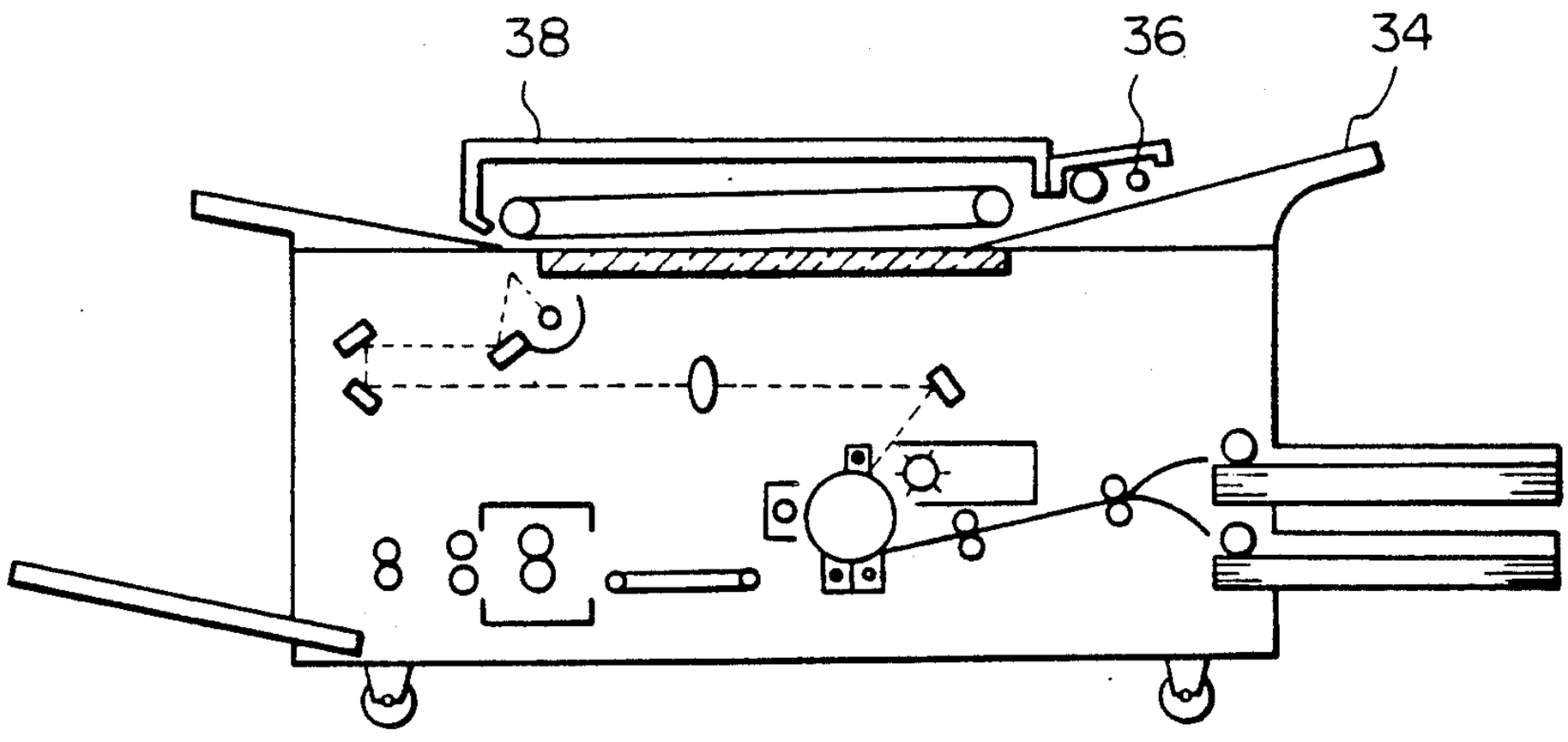


Fig. 4A

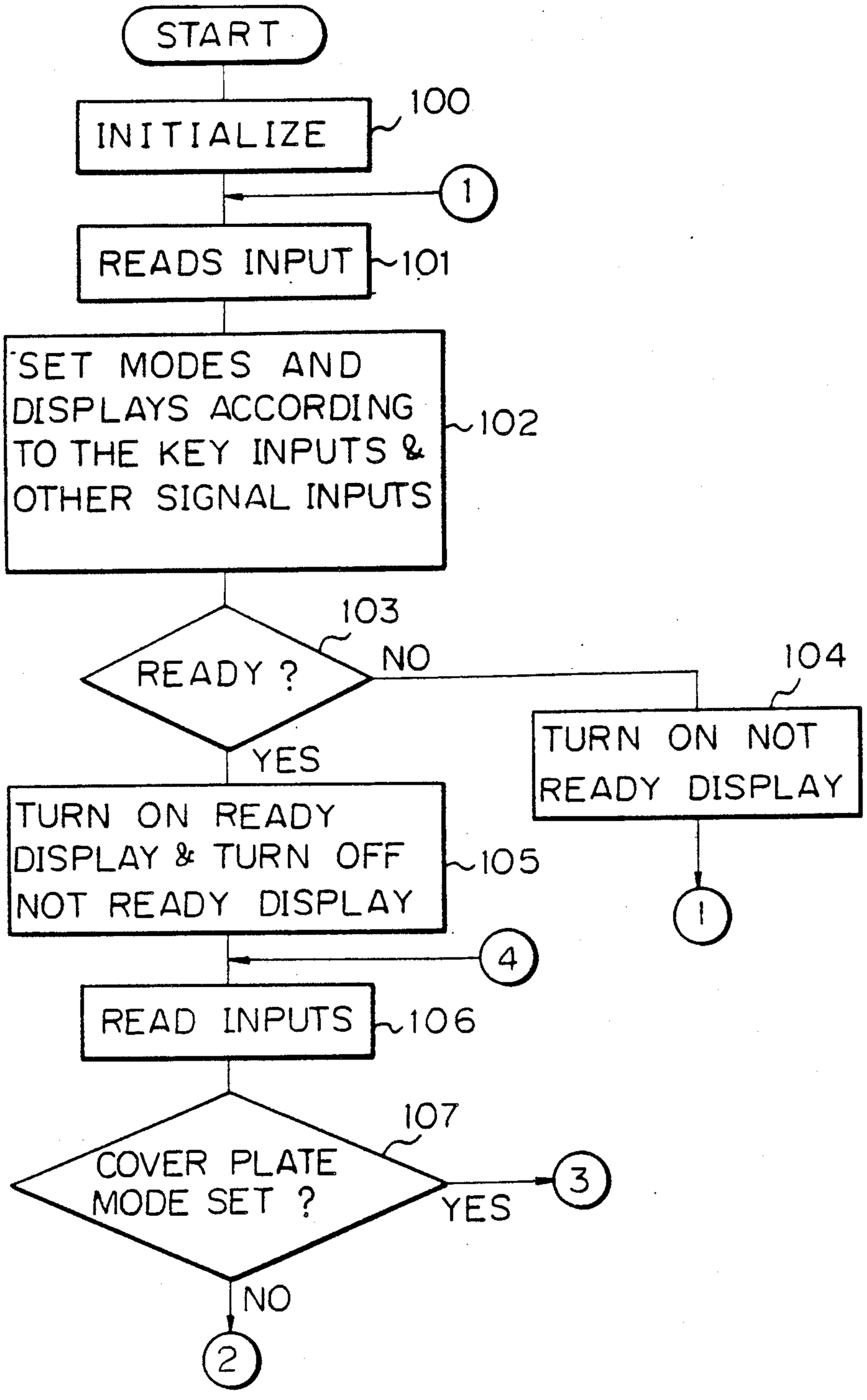

START
INITIALIZE
100
1
READS INPUT
101
SET MODES AND DISPLAYS ACCORDING TO THE KEY INPUTS & OTHER SIGNAL INPUTS
102
READY ?
103
NO
104
TURN ON NOT READY DISPLAY
YES
TURN ON READY DISPLAY & TURN OFF NOT READY DISPLAY
105
1
4
READ INPUTS
106
COVER PLATE MODE SET ?
107
YES
3
NO
2

Fig. 4B

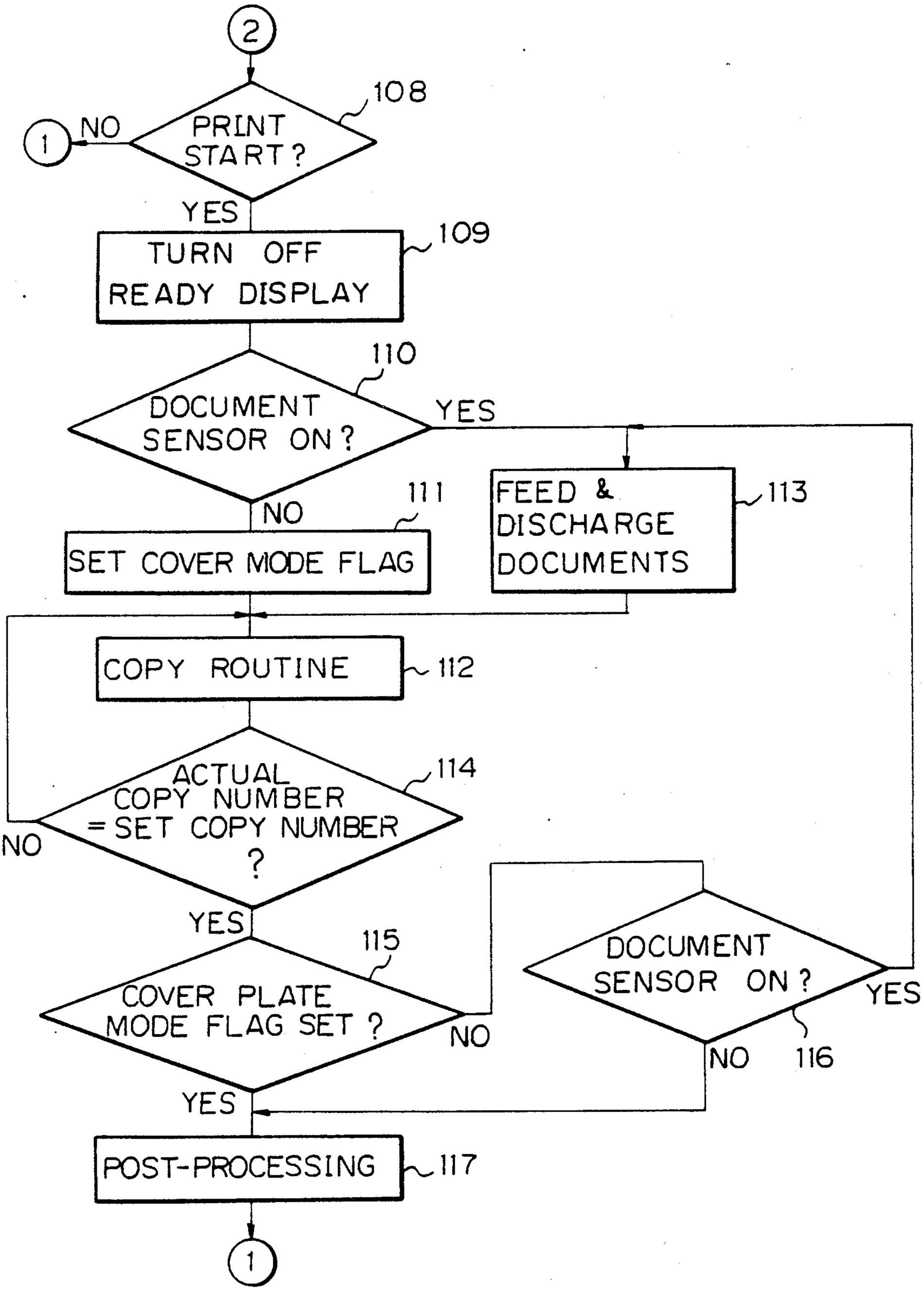

2
108
NO
1
PRINT START ?
YES
TURN OFF READY DISPLAY
109
110
DOCUMENT SENSOR ON ?
YES
NO
111
SET COVER MODE FLAG
FEED & DISCHARGE DOCUMENTS
113
COPY ROUTINE
112
ACTUAL COPY NUMBER = SET COPY NUMBER ?
114
NO
YES
115
COVER PLATE MODE FLAG SET ?
NO
YES
DOCUMENT SENSOR ON ?
YES
NO
116
POST-PROCESSING
117
1

Fig. 5A

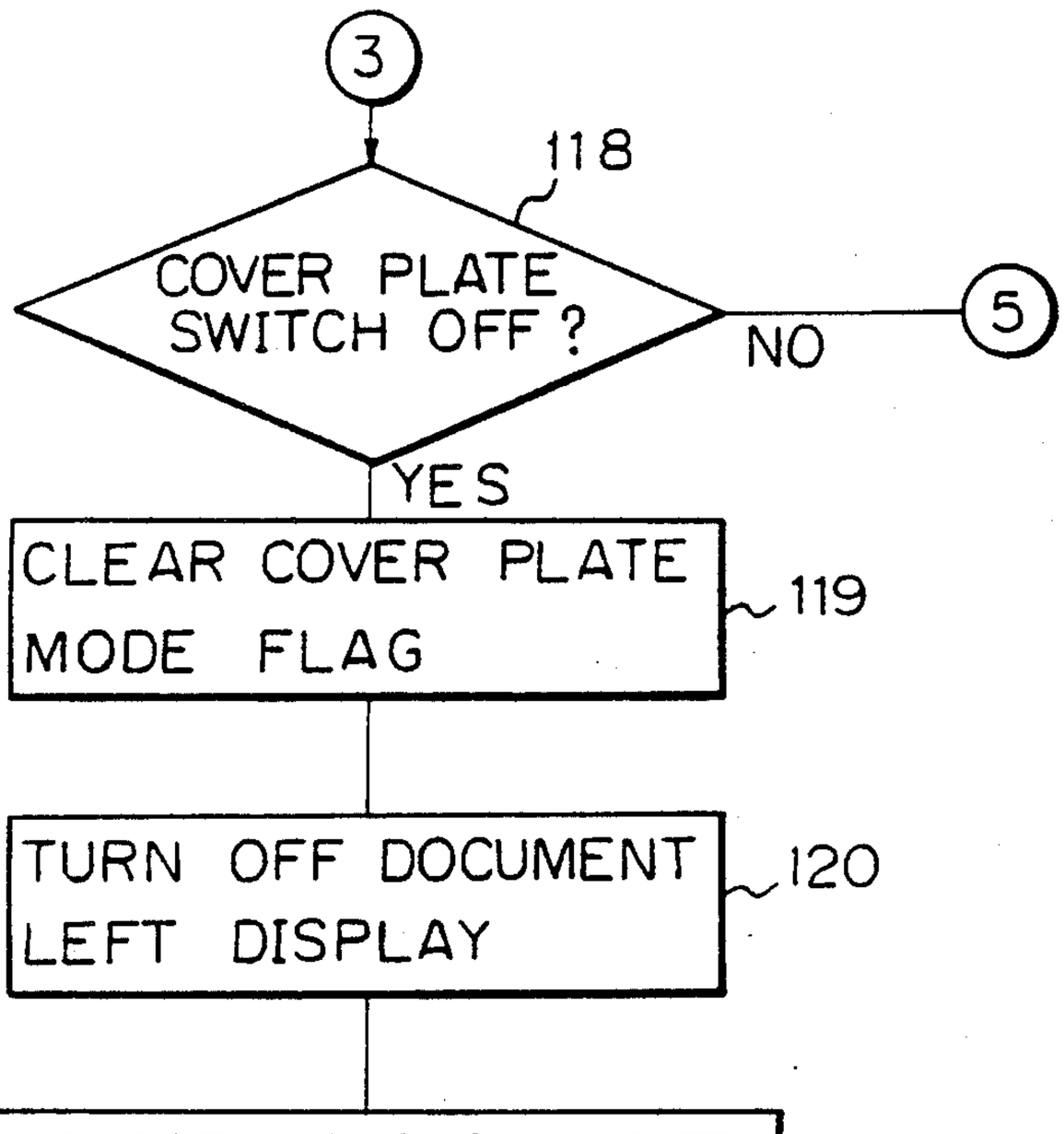

3
118
COVER PLATE SWITCH OFF ?
NO
5
YES
CLEAR COVER PLATE MODE FLAG
119
TURN OFF DOCUMENT LEFT DISPLAY
120
CLEAR FLAG T_1 & RESET 2-SECOND TIMER
121
6
CLEAR FLAG T_2 & RESET 100-MILLISECOND TIMER
122
1

Fig. 5B

Fig. 5B-1

Fig. 5B-2

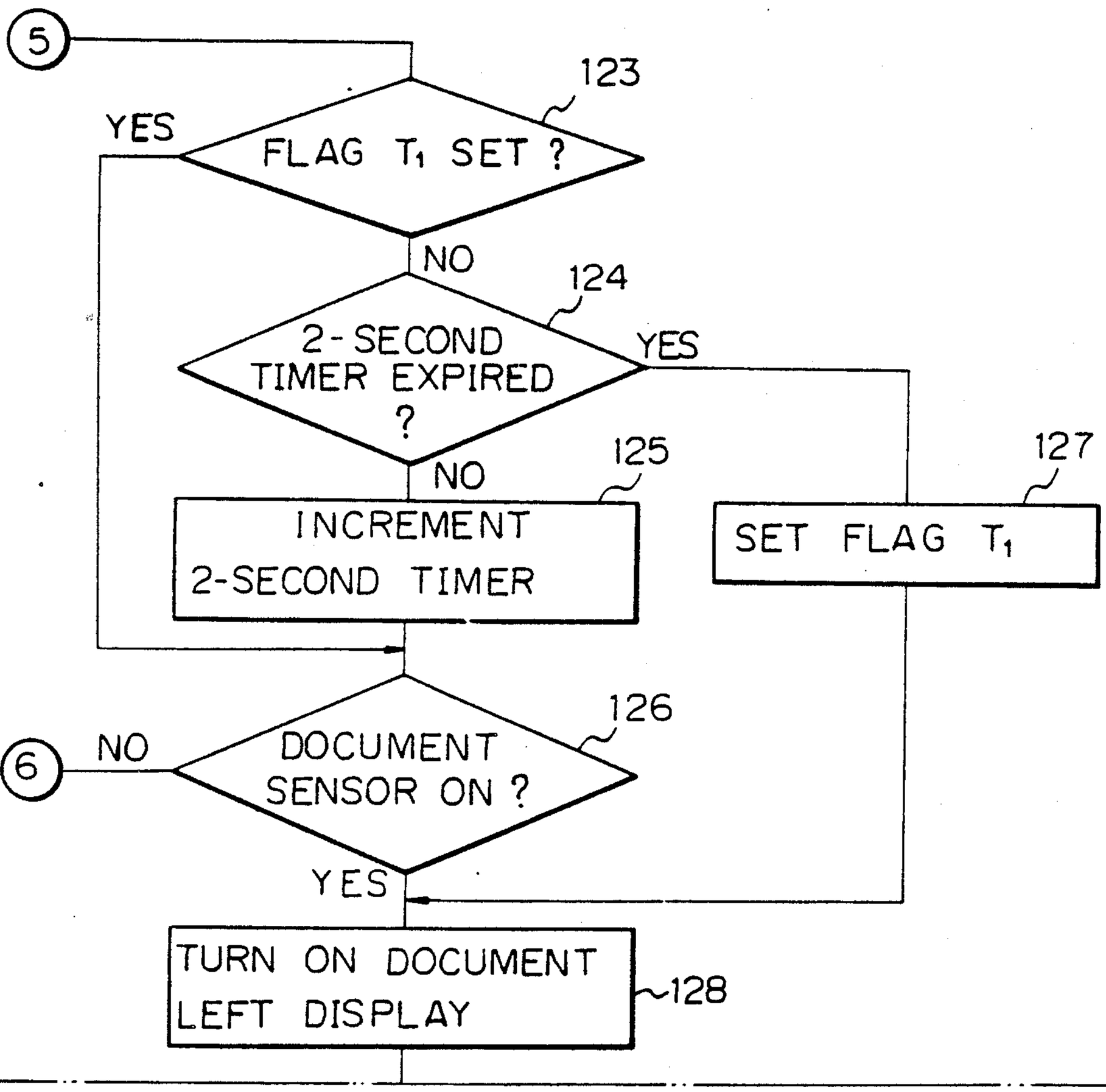
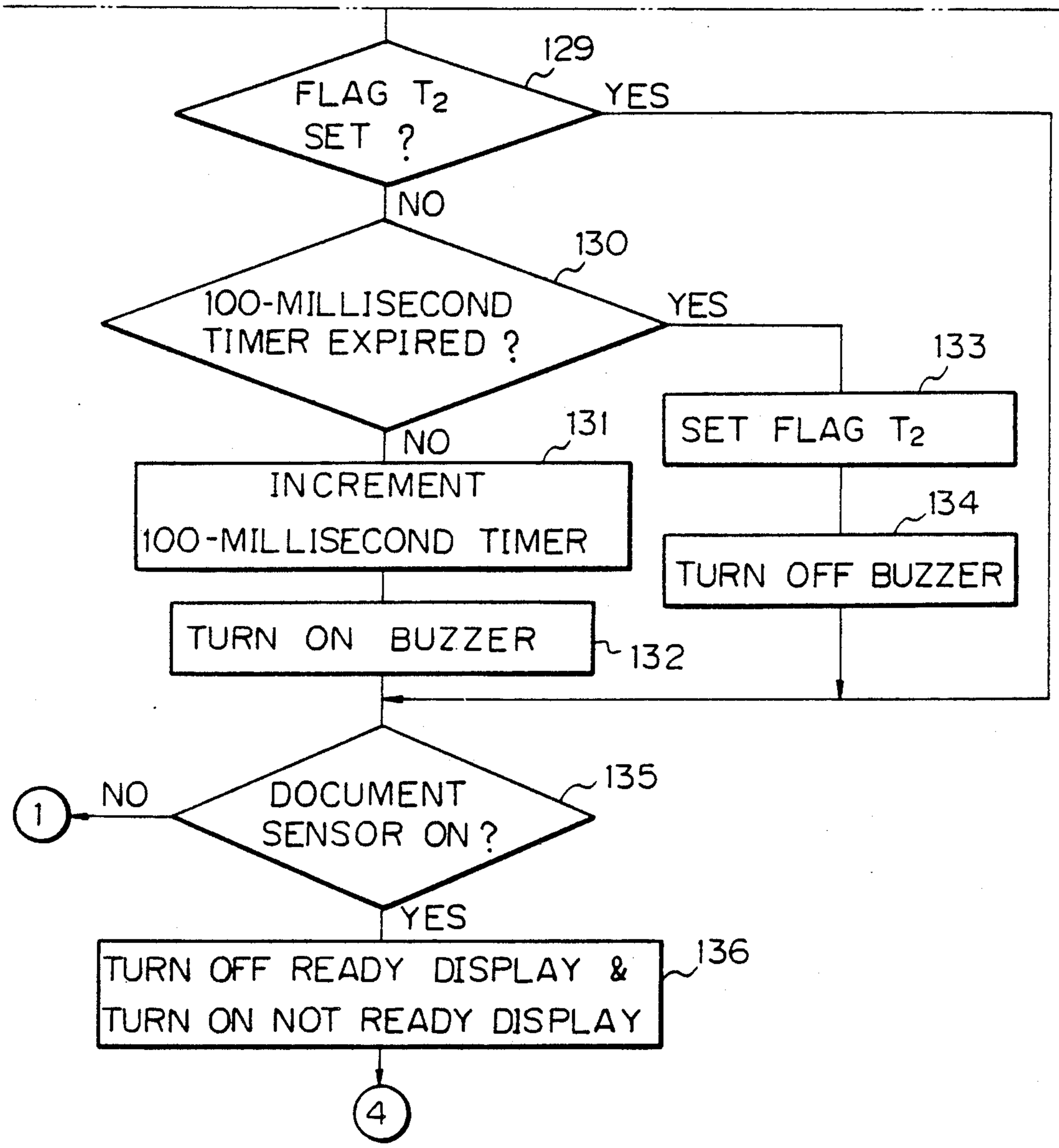


Fig. 5B-2


129
FLAG T_2 SET ?
YES
NO
130
100-MILLISECOND TIMER EXPIRED ?
YES
NO
131
INCREMENT 100-MILLISECOND TIMER
133
SET FLAG T_2
134
TURN OFF BUZZER
TURN ON BUZZER
132
1
NO
135
DOCUMENT SENSOR ON ?
YES
136
TURN OFF READY DISPLAY & TURN ON NOT READY DISPLAY
4

COPIES WITH AUTOMATIC DOCUMENT FEEDER

This application is a continuation of application Ser. No. 235,520, filed on Aug. 24, 1988, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a copier selectively operable in a cover plate mode which uses a cover plate and an automatic document feeder (ADF) mode which uses an ADF and, more particularly, to a copier provided with an implementation for preventing an original document left unremoved on a glass platen after an ADF mode operation from being not driven out of the copier to jam the copier and thereby being damaged itself.

A copier is generally operated in one of two different modes: a cover plate mode which uses a cover plate and an ADF mode which uses an ADF, as stated above. Specifically, in the cover plate mode an original document is laid on a glass platen of a copier body and then pressed from above by a cover plate which is openably mounted on the copier body. In the ADF mode which may be selected when a number of original documents are to be reproduced continuously, documents are loaded on a document feed table and then fed one by one by the ADF automatically to between the cover plate and the glass platen, each document undergoing reproduction being driven out of the copier body automatically. These two modes available with a copier promote efficient copying operations.

In the cover plate mode, it often occurs that a document is inadvertently left on the glass platen after it has been copied. When the ADF mode operation is effected without removing such a document, the document is not discharged from the copier to jam the copier and is therefore damaged itself. This kind of trouble has heretofore been coped with by adopting an audible alarm such as a buzzer or voice or a visible alarm such as a display which is provided on an operation board.

A problem with the buzzer or similar audible alarm is that it usually produces low sound for only a short period of time to avoid annoyance and, therefore, a person is apt to start on the next operation without noticing the sound. Even the display on the operation board is often overlooked by another person who may intend to operate the copier in the ADF mode. In any case, the document left on the glass platen would jam the copier without being discharged from the copier body.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a copier capable of preventing a document which is inadvertently left unremoved on a glass platen at the end of a cover plate mode operation from jamming the copier during an ADF mode operation which may follow the cover plate mode operation.

It is another object of the present invention to provide a generally improved copier with an ADF.

A copier selectively operable in a cover plate mode in which an original document is laid on a glass platen of a body of the copier and cover plate openably mounted on the body is closed to copy the document and an automatic document feeder (ADF) mode in which documents loaded on a document feed table of the copier are fed automatically one by one to between the cover plate being closed and the glass platen of the present invention comprises a cover plate position sensor for sensing an open and a closed position of the cover plate, a document sensor for sensing original documents which are loaded on the document feed table, and a control for controlling the copier such that after a copying operation has been executed in the cover plate mode, any further copying operation is inhibited when the cover plate position sensor senses a closed position of the cover plate and the document sensor senses original documents.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description taken with the accompanying drawings in which:

FIG. **1** is a schematic block diagram representative of one embodiment of the copier with an ADF in accordance with the present invention;

FIG. **2** is a side elevation showing the copier of FIG. **1**;

FIG. **3** is a schematic view showing various structural elements which are incorporated in the copier of FIG. **1**; and

FIGS. **4A**, **4B**, **5A**, **5B**, **5B-1**, and **5B-2** are flowcharts demonstrating a specific operation of the control system as shown in FIG. **1**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1** of the drawings, a copier embodying the present invention is shown in a schematic block diagram and generally designated by the reference numeral **10**. As shown, the copier **10** includes a copier controller **12** which serves as a main control and is chiefly implemented as a central processing unit (CPU). Applied to the copier controller **12** are the outputs of various copier signal detectors **14** which are incorporated in the copier **10**. The copier controller **12** delivers drive commands to copier loads **16** which include a motor solenoid and optics. An operation controller **18** is connected to the copier controller **12** while keys **20** are connected to the operation controller **18**. A liquid crystal display (LCD) **24** is connected to the operation controller **18** via an LCD driver **22**. The keys **20** and LCD **24** are provided on an operation board **26**, as shown in FIG. **2**. Further connected to the operation controller **18** is a buzzer **28** which alerts a person to a document which is left unremoved on a glass platen (no numeral).

An ADF **30** is associated with the copier **10** of the present invention. The ADF **30** includes an ADF controller **32**, a document sensor **36** responsive to documents which are loaded on a document feed table **34** (FIG. **3**), a cover plate position sensor **40** responsive to the position of a cover plate **38** which is openably hinged to the body of the copier **10** (see FIG. **3**), and an ADF load **42** for driving documents which are loaded on the document feed table **34**. The document sensor **36**, cover plate position sensor **40** and ADF load **42** may be implemented by an optical switch, a limit switch, and a motor, respectively.

The copier controller **12** is provided with three different kinds of flags, i.e., a cover plate mode flag, a flag T_1 and a flag T_2, and two different kinds of timers, i. e. a 2-second timer and a 100-millisecond timer. The cover plate mode flag is set when a copying operation is ef-

fected in the cover plate mode. The flag T_1 is set when the 2-second timer expires while the an ADF open/-close switch is in an ON state. An arrangement is made such that the LCD **24** on the operation board **26** is turned ON when the flag T_1 is set as stated, thereby alerting a person to a document left unremoved on the glass platen. The flag T_2 is set when the 100-millisecond timer expires while the ADF open/close switch is in an ON state. When this flag T_2 is set, the buzzer **8** is caused to sound for 100 milliseconds to notify a person of the presence of a document on the glass platen. The cover plate mode flag, flag T_1, flag T_2, 2-second timer and 100-millisecond timer are reset when the cover plate **38** is opened after a cover plate mode operation, i.e., when the ADF open/close switch is turned OFF.

A specific operation of the copier **10** in accordance with the present invention will be described with reference to FIGS. **4A**, **4B**, **5A** and **5B**.

Steps **100** to **117** shown in FIGS. **4A** and **4B** are representative of an ordinary copy mode, or cover plate mode, in which a document is laid on the glass platen and copied with the cover plate **38** being closed, and the ADF mode. On the other hand, steps **118** and onward shown in FIGS. **5A** and **5B** demonstrate a procedure which is executed when a document is inadvertently left on the glass platen after a cover plate mode operation.

When a power switch (not shown) of the copier **10** is closed, the copier **10** is initialized by locating the optics at a $\times 1$ magnification position, conditioning operation displays and indicators to their basic mode, etc. (step **100**). When a person enters desired operation modes on the keys **20**, the operation controller **18** reads the key inputs and sets up modes and displays as instructed thereby (steps **101** and **102**). If the copier **10** is ready to operate, a READY display is turned on and a NOT READY display is turned off. If the copier **10** is not ready to operate, an INHIBIT display command is delivered (steps **103** to **105**). Subsequently, the copier controller **12** reads input signals which are individually associated with the key inputs and fed from the operation controller **18** (step **106**). This is followed by determining whether or not the cover plate mode flag stored in a built-in register has been set (step **107**). As previously stated, the cover mode flag is set when a copy is produced in the cover plate mode and cleared when the cover plate **38** is opened to turn off the ADF open/-close switch. In the initialized condition immediately after the turn-on of the power switch, the cover plate flag remains cleared (the answer of the step **107** being "NO").

As the operator turns on a print start switch of the copier **10**, a READY display OFF command is produced to turn OFF the READY display (steps **108** and **109**). Then, whether or not the document sensor **36** is ON is determined (step **110**). If the document sensor **36** is not ON, i.e., if the cover plate mode is selected, a predetermined copying procedure is repeated after the cover plate mode flag has been set, until the number of copies entered on the operation board **26** is reached (steps **111**, **112** an **114**). Conversely, if the document sensor **36** is ON, meaning that the ADF mode has been selected, document feed and discharge commands are fed to the ADF load **42** (step **113**) so that a copying operation is repetitively executed until a desired number of copies are produced. In the ADF mode, as the desired number of copies are produced, the copying procedure is repeated until the document sensor **36** becomes OFF. When the copying procedure with all the documents loaded is completed, the program returns to the step **101** after post-processing including the removal of copies has been performed.

If the cover plate mode flag is set as decided at in the step **107**, i.e., after a cover plate mode operation, the program advances to steps **118** and onward shown in FIGS. **5A** and **5B**. In the step **118**, whether or not the cover plate position switch **40** is OFF is determined. If it is OFF, meaning that the a document has been removed after a cover plate mode operation by opening the cover plate **38**, the cover plate mode flag is cleared and a command for turning OFF a DOCUMENT LEFT display is produced (steps **119** and **120**). Subsequently, after the flag T_1 and 2-second timer have been reset (step **121**) and then the flag T_2 and 1-millisecond timer have been reset (step **122**), the program returns to the step **101**. If the cover plate position switch **40** is ON (the answer of the step **118** being "NO"), it shows that the cover plate **38** has not been opened after a cover plate mode operation, i.e., a document is left unremoved on the glass platen.

In the above condition, whether or not the flag T_1 has been set is determined and, if it has been set (the answer of a step **123** being "YES"), the program advances to a step **126**. If the flag T_1 has not been set (the answer of the step **123** being "NO"), the 2-second timer is started (step **124**) and, when it expires, the flag T_1 is set (step **127**). In a step **126**, whether or not the document sensor **36** is ON is determined. If it is not ON, meaning that no documents are loaded on the document feed table **34**, the operation returns to the step **122**. If the document sensor **36** is ON as determined by the step **126** or if the flag T_1 is set as determined by the step **123**, i.e., if a cover plate mode operation has been completed, the DOCUMENT LEFT display is turned ON upon the lapse of two seconds to alert the operator to the document which is left on the glass platen (step **128**).

Afterwards, whether or not the flag T_2 is set is determined (step **129**) and, if it not set, the 100-millisecond timer is started (step **130**) so that the the buzzer **28** is energized for 100 milliseconds to notify the operator of the presence of a document on the glass platen (steps **131** and **132**). Upon the expiration of the 100-millisecond timer, the flag T_2 is set while, at the same time, the buzzer **28** is turned OFF (steps **133** and **134**). When the flag T_2 is set and the document sensor **36** is ON (the answer of a step **135** being "YES"), i.e., when the operator does not notice the document being left on the glass platen, the READY display of the LCD display **24** is turned OFF and, instead, the NOT READY display is turned ON AND the copier **10** is controlled to inhibit a copying operation (step **136**).

If the document sensor **36** is OFF as decided in the step **135**, meaning that all the documents have been removed from the document feed table **34**, the program returns to the step **101**. Once the copying operation is inhibited in the step **136**, no copies are producible unless the cover plate position switch **40** is turned OFF to remove the document from the glass platen. In this case, a copying operation may be executed even if the document sensor **36** is ON.

In summary, it will be seen that a copier in accordance with the present invention allows an ADF mode operation to follow a cover plate mode operation only after a document copied in the cover plate mode has been removed from a glass platen. This prevents an occurrence that the document left on the glass platen jams the copier and is thereby damaged itself.

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof. For example, the buzzer **28** for producing a 100-millisecond alarm as shown and described may be replaced with a speech.

What is claimed is:

1. A copier selectively operable in a cover plate mode in which an original document is laid on a glass platen of a body of said copier and a cover plate openably mounted on said body is closed to copy said document and an automatic document feeder (ADF) mode in which documents loaded on a document feed table of said copier are fed automatically one by one to between said cover plate being closed and said glass platen, said copier comprising:

cover plate position sensor means for sensing an open and a closed position of said cover plate;

document sensor means for sensing original documents which are loaded on said document feed table; and

control means for controlling said copier such that after a copying operation has been executed in the cover plate mode, any further copying operation is inhibited unless said cover plate is first reopened when said cover plate position sensor senses a closed position of said cover plate and said document sensor senses original documents.

2. A copier as claimed in claim **1**, further comprising alarm means for, when said cover plate position sensor means senses the closed position of said cover plate after a copying operation in the cover plate mode, alerting a person to an original document which is left unremoved on said glass platen.

3. A copier as claimed in claim **2**, wherein said alarm means comprises a buzzer.

4. A copier selectively operable in a cover plate mode in which an original document is laid on a glass platen of a body of said copier and a cover plate openably mounted on said body is closed to copy said document and an automatic document feeder (ADF) mode in which documents loaded on a document feed table of said copier are fed automatically one by one to between said cover plate being closed and said glass platen, said copier comprising:

cover plate position sensor means for sensing an open and a closed position of said cover plate;

document sensor means for sensing original documents which are loaded on said document feed table; and

control means for controlling said copier such that after a copying operation has been executed in the cover plate mode, until said cover plate is first reopened any further copying operation is inhibited when said cover plate position sensor senses a closed position of said cover plate, said document sensor senses original documents, and the cover plate mode is not yet set.

5. A copier as claimed in claim **4**, further comprising alarm means for, when said cover plate position sensor means senses the closed position of said cover plate after a copying operation in the cover plate mode, alerting a person to an original document which is left unremoved on said glass platen.

6. A copier as claimed in claim **5**, wherein said alarm means comprises a buzzer.

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